AGRICULTURAL RESEARCH AND THE OFFICE OF NATIONAL PROGRAMS

AGRICULTURAL AIR QUALITY TASK FORCE
APRIL 6, 2016

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NATIONAL PROGRAM LEADER: SOIL AND AIR
NATURAL RESOURCES & SUSTAINABLE AGRICULTURAL SYSTEMS
OFFICE OF NATIONAL PROGRAMS
“...procure and preserve all information concerning agriculture..... by means of books and correspondence, and by practical and scientific experiments.....
We are going to have to increase production – but how?

- Produce more per unit land area (“sustainable intensification”)
  - Mechanization
  - Crop/livestock genetic improvement
  - Input use efficiency
  - Protecting the health of our natural resources
But what does “sustainable” mean?

Productive  

Good land stewardship  

Profitable

... To those who produce food & fiber

"Development that meets the needs of the present generation, without compromising the ability of future generations to meet their own needs."  

Brundtland Commission, 1987
OVERVIEW OF THE AGRICULTURAL RESEARCH SERVICE

- In-house research arm of USDA
- Farm-to-table, molecules-to-watersheds research scope
- 17 National programs
- ~800 research projects
- Partnerships with universities and industry

- ~8,000 employees
- ~1,600 scientists
- More than 90 locations (4 overseas labs)
- $1.1 billion annual budget
- Additional funds in competitive grants, and other research agreements
The bold lines reflect the boundaries of the ARS geographic Areas.
NATIONAL PROGRAM AREAS

Nutrition, Food Safety and Quality

Animal Production and Protection

Crop Production and Protection

Natural Resources and Sustainable Agriculture Systems
ARS RESEARCH IN NATURAL RESOURCES & SUSTAINABLE AGRICULTURAL SYSTEMS

- Water Availability & Watershed Management
- Climate Change, Soils, and Emissions
- Bioenergy and Energy Alternatives
- Agricultural and Industrial Byproducts
- Pasture, Forage, and Rangeland Systems
- Agricultural System Competitiveness and Sustainability

- 450 Scientists
- 139 Research Projects
- 62 Locations
MY ROLE AS A NATIONAL PROGRAM LEADER

Vision and priority setting
Coordination and relevance
Inreach – foster communication and collaboration
Outreach – communicating results to ensure impact
Ensure efficient use of resources
Enable Improvements of Air Quality via Management and Mitigation of Emissions from Agricultural Operations

Develop Knowledge and Technologies for Reducing Atmospheric Greenhouse Gas Concentrations Through Management of Agricultural Emissions and Carbon Sequestration

Enable Agriculture to Adapt to Climate Change

Maintain and Enhance Soil Resources

Total Projects: 35
Total Locations: 29
Total Scientists: 94
AGRICULTURAL AND INDUSTRIAL BYPRODUCTS

- Management, Enhancement, and Utilization of Manure Nutrients and Resources
- Manure Pathogens and Pharmaceutically Active Compounds (PACs)
- Atmospheric Emissions
- Developing Beneficial Uses of Agricultural, Industrial and Municipal Byproducts

Total Projects: 15
Total Locations: 13
Total Scientists: 42
Component 1
Management and stewardship of soil resources

Component 2
Managing Nutrients in Agroecosystems

Component 3
Reducing Environmental Risk of Agricultural Operations

USDA Agricultural Research Service National Program 212—Soil and Air Action Plan 2016-2020
Data Networks Across ARS

NP212: ACTION PLAN – “NP 212 research results will also be used to facilitate data synthesis and utilization in GRACEnet, REAP, and other ARS databases”.

Greenhouse gas Reduction through Agricultural Carbon Enhancement

GRACEnet:
- Mitigate GHG emission
- Carbon Sequestration
- Improve environmental quality

DATA Entry Template/GRACEnet data base

Resilient Economic Agricultural Practices (REAP):
- Soil health/quality
- Soil carbon/organic matter
- Productivity

DATA Entry Template/GRACEnet data base

Component 1
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Component 3
Reducing Environmental Risk of Agricultural Operations

Multi-agency Conservation Effects Assessment Project (CEAP):
- Watershed scale

Livestock GRACEnet:
- animal system centric
  - Mitigate GHG emission (N2O, CH4, CO2)

LTAR – NP211
- Agro-ecosystem productivity
- Climate variability and change
- Conservation and environmental quality
- Socio-economic viability and opportunity
- Metrological data - NAL

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*REAP’s programmatic home

Grand Challenge: Transform agriculture to deliver a 20% increase in quality production at 20% lower environmental impact by 2025.
Greenhouse gas Reduction through Agricultural Carbon Enhancement network GRACEnet

GOAL

Identify and develop agricultural strategies to enhance soil carbon sequestration and reduce greenhouse gas emissions and provide a scientific basis for carbon credit programs, to reduce net greenhouse gas emissions and improve environmental quality.

OBJECTIVES

1. Evaluate status and direction of change in soil carbon for typical and alternative agricultural systems.

2. Determine net greenhouse gas emissions (carbon dioxide, methane and nitrous oxide) of current agricultural systems for typical and alternative agricultural systems.

3. Determine the environmental effects (water, air and soil quality) of agricultural systems developed to reduce greenhouse gas emissions and increase soil carbon storage.

APPROACH

Consistent protocols for soil, trace gas and plant sampling are used across the network.

Assessment within GRACEnet follows four location-specific scenarios:

1. Business as usual in production agriculture for various areas of the country.
   - What is the carbon accumulation/loss rate under typical agricultural management?

2. Maximizing carbon sequestration rate.
   - What can be done to reach the highest carbon sequestration rate?

   - Agriculture is the main source of nitrous oxide and methane to the atmosphere. Practices will be developed to decrease the emission of these gases. What can be done to reach the highest carbon sequestration rate?

4. Maximizing environmental benefits by improving water, air, and soil quality.
   - This scenario investigates management systems to optimize both agricultural and environmental benefits, by sequestering soil carbon and decreasing greenhouse gas emissions.
RESILIENT ECONOMIC AGRICULTURAL PRACTICES

Nationwide Network of REAP ARS Scientists

Objective
Develop biomass feedstock harvest rates and management strategies that safeguard the soil so it can meet the demand for food, feed, fiber, and fuel.

Challenge
How to harvest corn and other residues without deleting soil organic carbon or increasing risk of erosion, and risking loss of soil productivity.

Management Strategies
1. Inclusion of perennials
2. Cover crops
3. Living mulch
4. Reducing tillage
5. Limiting harvest rates

Opportunities
Successful biomass feedstock systems:
1. Produces food, feed and fiber for an increasing world population
2. Provides ecosystem services: erosion control, carbon sequestration, wildlife habitat and protects water quality
3. Replenishes soil organic carbon and cycles plant nutrients
4. Produces feedstock for biofuels

Soil C change with management

The amount of stover that can be sustainably harvested will vary by management. In this example, stover in the shaded area would be sustainably harvestable under moldboard plow tilage in a corn-soybean rotation (blue dashed line).

Harvestable amounts will vary by crop and region.
Long Term Agro-ecosystem Research Network

**SHARED RESEARCH STRATEGY**

- **FOUR PRIORITY AREAS OF CONCERN**
  - Agro-ecosystem productivity;
  - Climate variability and change;
  - Conservation and environmental quality;
  - Socio-economic viability and opportunities.

- **FOUR KEY PRODUCTS**
  - New knowledge of processes & systems;
  - New technologies & management practices;
  - Improved agro-ecological models;
  - Comprehensive, accessible data.
CHARNET

USDA-ARS Biochar and Pyrolysis Initiative (CHARNet)

16 Locations – Coordinated Multi-location Research Activities
Welcome to the National Wind Erosion Research Network

The National Wind Erosion Research Network was established in 2014 as a collaborative effort led by the US Department of Agriculture (USDA) Long Term Agro-ecological Research (LTAR) network and the Bureau of Land Management (BLM). The research domain incorporates the diverse soils and vegetation communities in the rangelands and croplands of the western United States, with sites located in New Mexico, Texas, Arizona, California, Colorado, North Dakota, Utah, Idaho and Washington.

★ USDA Long Term Agroecosystem Research (LTAR) National Wind Erosion Research Network sites
★ USDA Agricultural Research Service (ARS) National Wind Erosion Research Network sites
★ Bureau of Land Management (BLM) National Wind Erosion Research Network sites
★ Department of Defense (DoD) National Wind Erosion Research Network sites
★ USDA LTAR Network locations
• Soil Biology Network
• Nutrient Management Network
• Others
Questions?

Thank You!

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